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REMARKS

This communication is responsive to the Office Action mailed on March 31, 2004. Claims 1-28 are pending in the application. The Abstract has been amended.

As a preliminary matter, Applicants note that the Examiner did not initial the references listed on Applicant's 1449 form submitted with Applicant's July 9, 2003 Information Disclosure Statement. Applicants respectfully request that the Examiner consider the references, initial and return to Applicants a copy of the 1449 form. For the Examiner's convenience a duplicate copy of the PTO-1449 form is enclosed.

The Examiner has rejected Claims 1-28 under 35 U.S.C. 103(a) as being unpatentable over Kissinger (U.S. Patent No. 3,327,584) in view of Franklin et al. (U.S. Patent No. 6,628,408). The rejection is respectfully traversed.

Discussion of Prior Art

The combination of the Kissinger reference and the Franklin et al. reference fails to disclose or suggest each of Applicants' claimed elements.

The Kissinger reference merely teaches a proximity detector for sensing the relative position of a test object (Col. 10, lines 48-49). The Examiner cites to Figure 23 and the corresponding description of the Kissinger reference (see Col. 6, lines 26-71).

However, the Kissinger reference does not teach or suggest a device for checking bores in or edges on an object of measurement. The Kissinger reference merely teaches a detector wherein a portion of transmitted light beams is reflected from a test object 168 back through a light detector 166. Another portion of the transmitted light beam is reflected from a reflective surface 170 back to a light detector 164 (Col. 6, lines 50-55). The reflective surface 170, a light contacting medium 158 and the light detector 164 are used as a reference or standard to the variable reflected light beam from the test object 168 (Col. 6, lines 55-58).

The use of the reference as a standard serves as a control means for the compensation of the effects of probe growth at high temperatures and/or for possible movement of fiber mediums (Col. 6, lines 68-71). It is quite apparent that the detectors 164 and 166 do not have individual detector heads positionable at a distance from the object of measurement, with the detector head and the object of measurement being moveable relative to one another.

In Applicants' claimed invention, as set forth in claim 1, the first distance sensor has a detector head positionable at a distance from the object of measurement. The detector head and object of movement are moveable relative to each other. The second distance sensor is adapted to scan an object of reference in correlation with the first distance sensor.

Applicants' further claim a comparator for comparing the measurement signals of the first distance sensor and the second distance sensor. In this manner, the object of measurement is characterizable in relation to the object of reference.

In contrast, the Kissinger reference teaches that the reflective surface 170, the light conducting medium 158 and light detector 164 are used as a reference or as a standard (Col. 6, lines 55-57). This cannot be seen as an object of reference in the sense of the present invention. If the detector itself is part of the reference, no separate object of reference is provided.

Additionally, it is not possible to scan an object of reference with the detector 164 of the Kissinger reference. On the contrary, the reflective surface 170 is mounted in the beam and can only be adjusted with respect to the distance of the gap between the end of the probe and the reflective surface (Col. 6, lines 45-47).

The Franklin et al. reference does not remedy the defects of the Kissinger reference. The Franklin et al. reference teaches a method for measuring an amplitude of an ultrasonic horn for ultrasonic bonding of materials such as composite webs during processing of the material being bonded (Col. 1, lines 8-13).

Applicants' respectfully assert that the Franklin et al. reference has no relation to a device for checking bores in or edges on an object of measurement. Applicants first traverse the rejection on the grounds that Kissinger and Franklin et al. are non-analogous art. For the purposes of evaluating obviousness of claimed subject matter, the particular references relied upon must constitute "analogous art." The art must be from the same field of endeavor, or be reasonably pertinent to the particular problem with which the inventor is involved. The Franklin et al. reference is not in the same field of endeavor and is not reasonably pertinent to the particular problem of

checking bores in or edges on an object of measurement. The Franklin et al. reference explicitly teaches the object of measuring the amplitude of a stationary and rotating ultrasonic horns during production of an ultrasonically bonded web material.

Moreover, secondary considerations support the conclusion that the present invention is nonobvious. Specifically, long-felt need, failure of others to solve the problem, unexpected results and the commercial success of the invention are indicia of non-obviousness. The Court of Appeals for the Federal Circuit has made it clear that such secondary considerations of non-obviousness must be considered. The intractable nature of the problem - i.e., long-felt need and failure to solve - is a strong indicator of nonobviousness.

In the relevant technical field there was a longstanding need to provide a burr examination sensor device. The present invention provides such a burr examination sensor device. Such a device is neither disclosed in Kissinger and Franklin et al. nor remotely suggested by these documents.

It has been a longstanding problem to provide a burr examination device which allows a non-time-consuming examination of burrs and allows quantitative information content to be inferred. Burr examinations have usually been carried out manually in that, for example, a corresponding workpiece surface is felt with a finger, the finger nail, a tooth pick, a cleaning tube of cotton wool lining, the tip of a pencil or a marker mandrel. Visual methods have also used where, for example, a burr is examined with the naked eye, under a microscope or by means of a magnifying glass, an autoscope, or by means of an

endoscope. None of these prior art techniques provide the advantages of Applicants' claimed system.

Applicants' inventive sensor device has received a warm welcome and has been appreciated in the field. Indeed, Applicants' claimed device has earned the two separate awards. In particular, Applicants' inventive burr sensor system was selected by R&D magazine as one of the one hundred most technological significant new products of the year 2003. Further, Applicants' were awarded the "AutoTec Award 2003" by the International Institute for Research as the best innovation in automotive technology for 2003.

Exhibits A-C submitted herewith provide evidence of commercial success and acknowledgement by skilled artisans that Applicants' claimed invention overcame a long felt need in the art and are evidence of nonobvious. Exhibit A is a copy of the AutoTec Award 2003. Exhibit B is a copy of the R&D 100 Award. Exhibit C is a brochure describing Applicants' award winning system, which is the subject if the present application.

Lastly, Applicants assert that the combination of the Kissinger reference and the Franklin et al. reference fails to teach or suggest Applicants' claimed invention. Specifically, the prior art references of Kissinger and Franklin et al. fail to teach or remotely suggest a device for checking bores in or edges on an object of measurement, in particular, for recognizing burrs, comprising a first distance sensor with a detector head positionable at a distance from the object of measurement, the detector head and object of measurement being movable relative to one another. As set forth in Applicants' claim 1, the detector head couples electromagnetically with the object of measurement or the object of measurement is able to be

acted upon with an electromagnetic signal by the detector head, and the coupling with the object of measurement or an electromagnetic reaction signal of the object of measurement to the signal acting upon it is dependent upon a distance between detector head and object of measurement so that this distance is determinable in a contact-free manner. A surface of the object of measurement is scannable by the detector head in a contact-free manner.

Moreover, there is no teaching or suggestion in the prior art of a second distance sensor by means of which an object of reference is scannable in correlation with the first distance sensor, and a comparator for comparing the measurement signals of the first distance sensor and the second distance sensor, so that the object of measurement is characterizable in relation to the object of reference, as set forth in Applicants' claim 1.

Still further, there is no teaching or suggestion in the cited prior art combination of a method for checking bores in or edges on an object of measurement, and, in particular, for recognizing burrs. Particulary, the prior art fails to teach or disclose a method comprising scanning a prepared object of reference with a distance sensor, scanning the object of measurement in correlation therewith with a further distance sensor, and comparing the measurement signals of the two distance sensors, as set forth in Applicants' claim 25.

Applicants' respectively assert that a suface examination of a bore or edge, in particular, a burr check can be carried out in a simple way by use of the inventive distance sensor as a separate component, with this distance sensor interacting with a workpiece and the interaction depending on the distance beteen the distance sensor and the workpiece. The distance sensor

forms a sensor field that couples locally with the workpiece. As a result, inner workpiece surfaces can also be checked when the distance sensor is inserted into the workpiece. Checking for the burr is carried out without any contact being made and so a simple, and in particular, a mechanical use is enabled (e.g., see page 3, lines 4-13 of Applicants' specification).

Still further, owing to the object of measurement and an object of reference being scanned in a correlated manner, a deviation between object of measurement and object of reference can be deduced in a simple way, for example, from a difference between measurement signals of the two distance sensors. If the object of reference is ideally prepared, a difference then means that the object of measurement contains a flaw. It can then be determined from the magnitude of the differential signal, for example, whether the object of measurement is still usable or has to be eliminated from the production process, i.e., lies beyond a tolerance range (e.g., see page 3, lines 15-23 of Applicants' specification).

With the inventive device, a quick and simple examination of objects of measurement can be carried out, for example, in series production, and automation of this examination with respect to the evaluation is also possible(e.g., see page 3, lines 25-28 of Applicants' specification).

Aside from burrs, other deviations in relation to the prepared bores in the object of reference are also recognizable, for example, deviations in shape or deviations in dimension (e.g., see page 4, lines 1-3 of Applicants' specification). The advantages discussed above also pertain to the method as set forth in Applicants' claim 25.

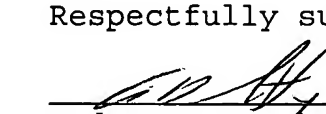
In view of the above, Applicants' respectfully submit that the claimed invention is not rendered obvious by the combination of the Kissinger reference and the Franklin et al. reference, or any of the other prior art references of record, taken alone or in combination. The prior art simply fails to teach or suggest a device for checking bores in or edges on an object of measurement and associated features of Applicants' claimed invention. Moreover, since independent claims 1 and 25 are not rendered obvious, then claims 2-24 and 26-28 dependent thereon are believed to be allowable.

Further remarks regarding the asserted relationship between Applicants' claims and the prior art are not deemed necessary, in view of the foregoing discussion. Applicants' silence as to any of the Examiner's comments is not indicative of acquiescence to the stated grounds of rejection.

Conclusion

In view of the above, entry of the present amendment and reconsideration and allowance of each of the claims is respectfully requested. If there are any remaining issues that need to be addressed in order to place this application into condition for allowance, the Examiner is requested to telephone Applicant's undersigned attorney.

Respectfully submitted,



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Date: July 29, 2004

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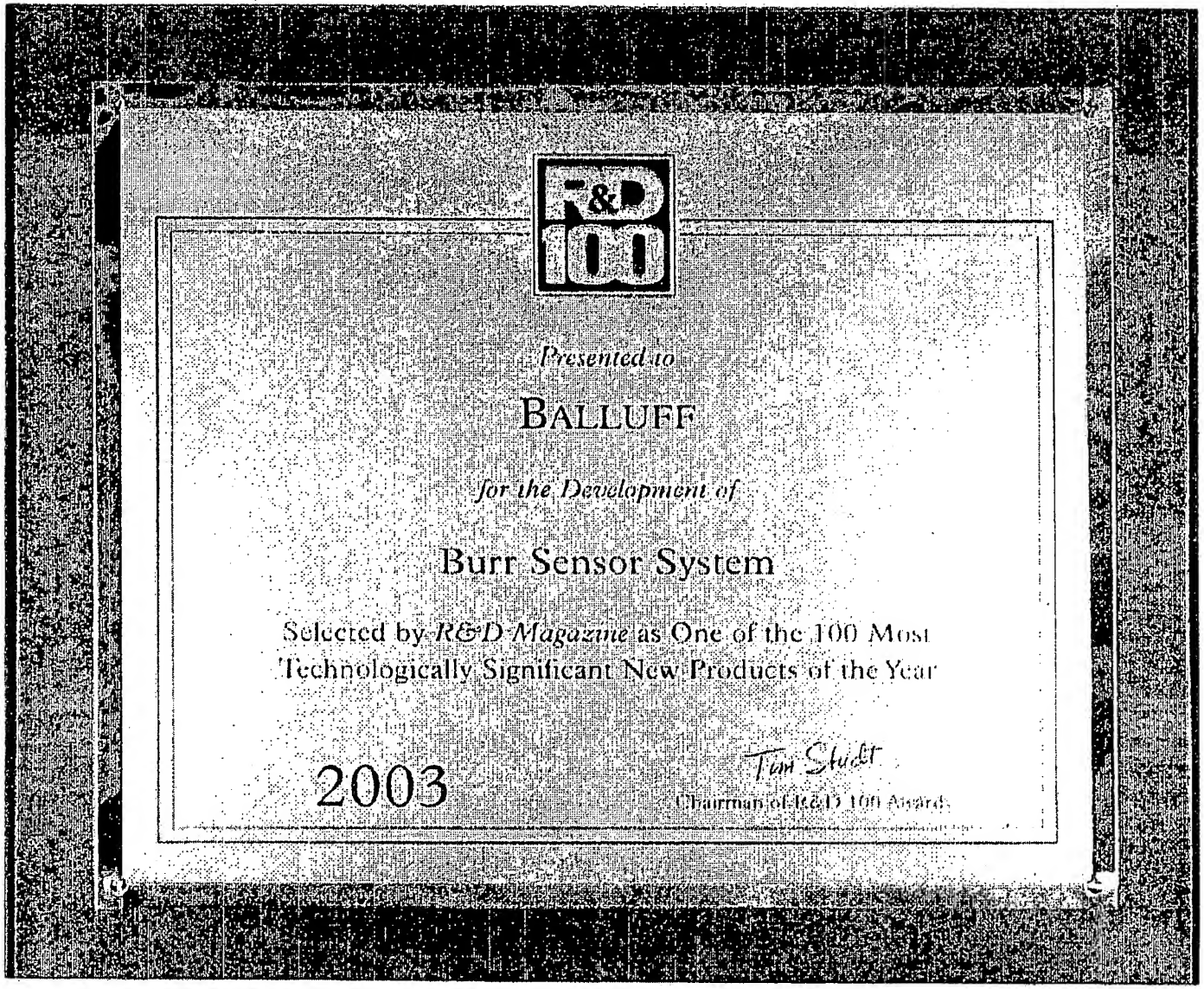
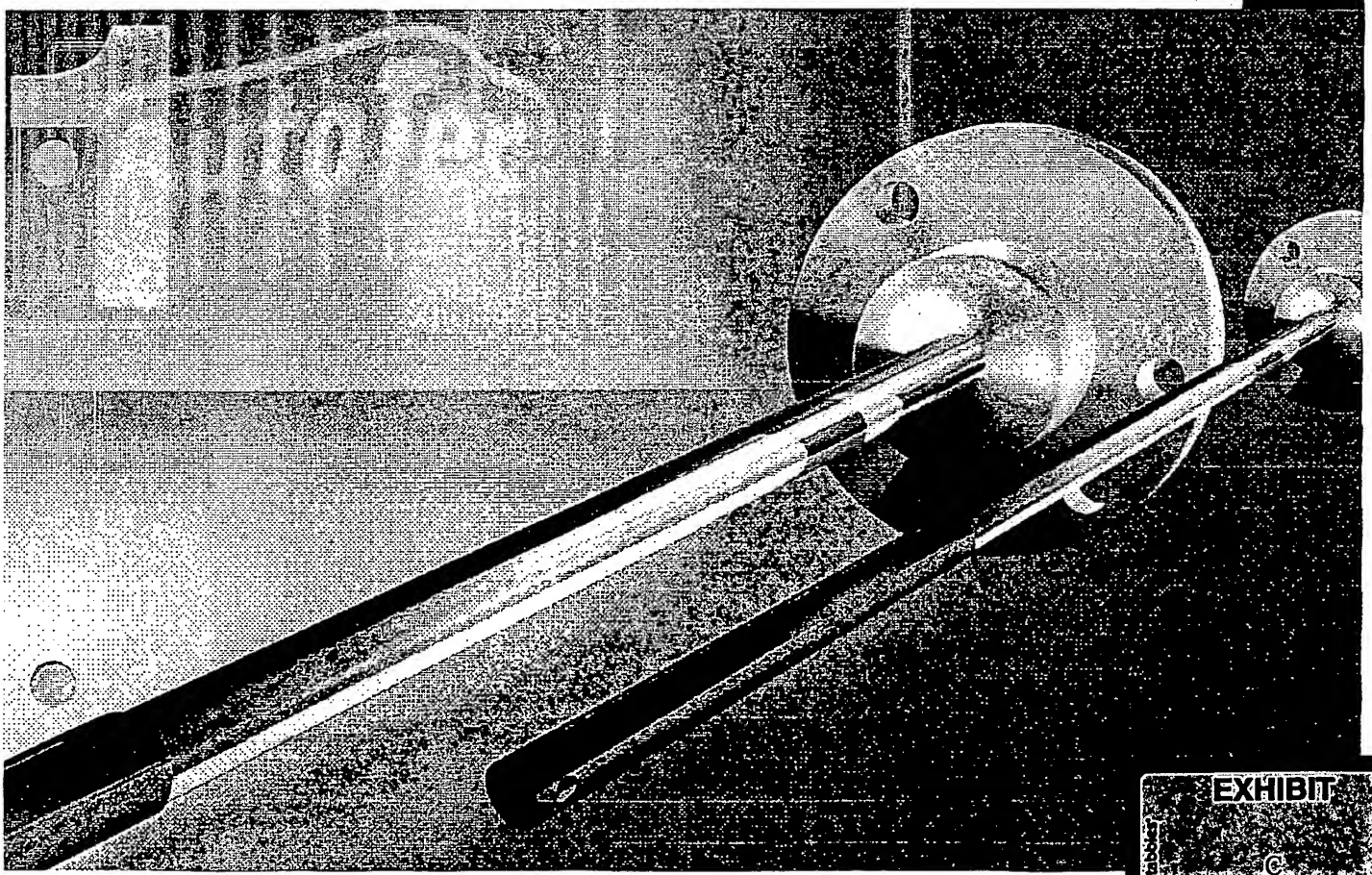


BALLUFF

Inductive Burr Probe Project

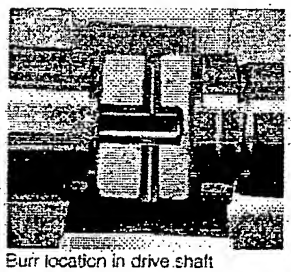
... awarded 1st prize for innovative automotive technology



EXHIBIT

C

Inductive Burr Probe Project



Burr location in drive shaft

A burr is often created during cutting operations in any phase of automobile manufacturing, such as when drilling through-holes in engine blocks or producing drive shafts.

The degree of burr formation depends among other things on the material of the cutting tool (drills, end milling cutters, etc.), on the machining parameters and on the composition of the workpiece and may even vary during series production.

A burr can cause a variety of problems. Burrs may represent a potential for injury during handling, may affect the flow of oil on parts in the drive area or may break off and thus cause premature wear.

For all of these reasons, many parts are 100 % deburred. In the case of many quality-dependent parts (such as injection nozzles in a common rail system), manual quality inspection is additionally required to ensure that the workpieces are truly absolutely burr-free. This is extremely difficult when it comes to interior hole intersections. The costs for deburring and for manual burr inspection can amount to several percent of the cost of the parts.

Up to now there has been no universal, industrial quality measuring system for quantitative assessment of burrs which can be integrated into production processes.

To solve this basic problem, the Burr Minimization Industry Workgroup was founded at the end of 1999. In 2001, Balluff GmbH joined this Workgroup with the goal of developing a measuring system which would meet the requirements outlined above. After some framework studies, a unique inductive measuring system was soon developed, which is currently in the prototype stage and which has already passed the first round of practical tests in the automobile industry.

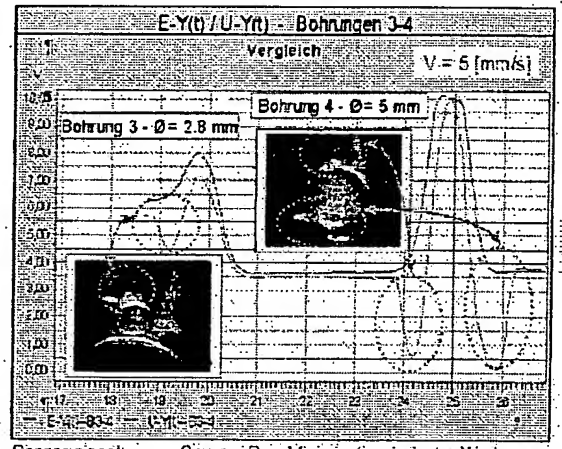
In addition to burr sensing, this rugged sensor system can be integrated into metallic workpieces in industrial production systems for general edge and geometry measuring purposes. The probe is ruggedly constructed, and the measurements are unaffected by oil, lubrications and contamination.

This makes the system easy to integrate into industrial production areas without impacting the cycle times.

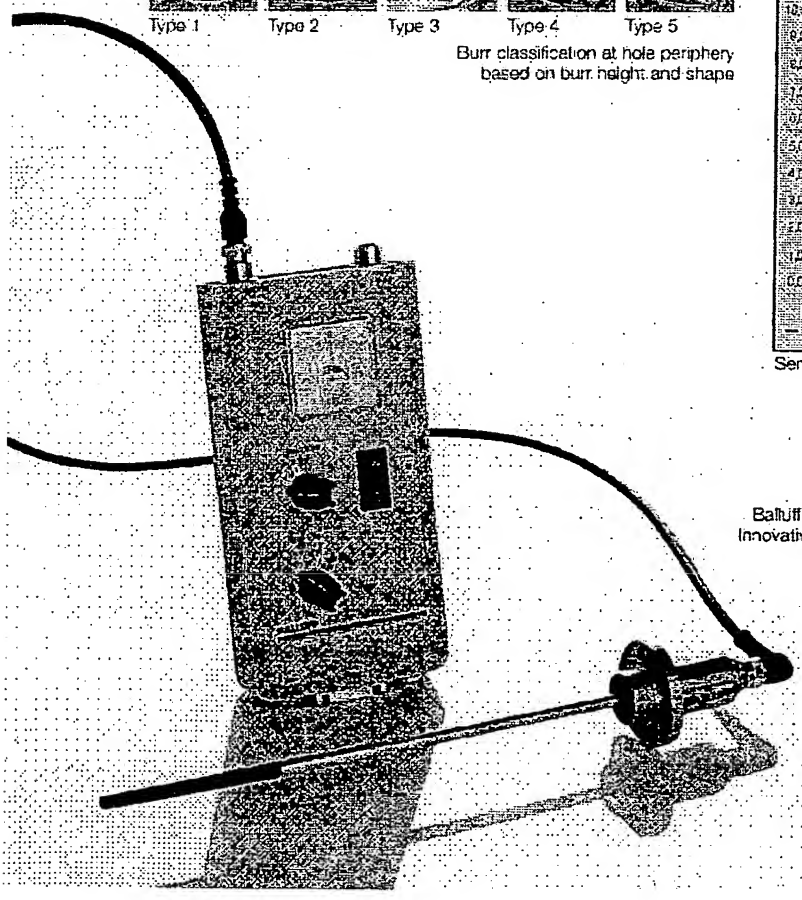
Use of the measuring system will increase part quality levels in every area of production. Trend analyses make statistical process control possible and allow significant cost savings.

Type 1 Type 2 Type 3 Type 4 Type 5

Burr classification at hole periphery based on burr height and shape



Sensor signal Source: Burr Minimization Industry Workgroup



Balluff was awarded 1st Prize for Innovative Automotive Technology. www.autotec aktuell.de

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No. 828997 E - Edition 0303 Subject to modification.